MODELLING APPROACH AND DATA REQUIREMENTS: CASE OF THE FREIGHT MODEL FOR ARGENTINA

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John P Pritchard, Transport Modeller/Policy Analyst, ITF

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IKI INTERNATIONAL CLIMATE INITIATIVE
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of the Federal Republic of Germany
Importance of Data
Importance of data

• Accurate data collection is essential to maintain integrity of research and policy analysis
  – Avoid compromising decisions for public policy

• Enables the definition and analysis of EFFECTIVE policies
  – What is the aim?
  – How is success quantified?
  – Did it achieve its aim?
Importance of data: Effective Policy

• Data allows us to **understand existing issues**

• When defining policy **aims and goals**, the **data needed** to quantify impact should be defined

• **Suitability of Models** to the context

• **Ex-ante** analysis of alternatives and scenarios

• **Ex-post** analysis of results
Data collection: Things to consider

- **What data is needed?**
  - Necessary to be **strategic** in data collection
    - Data collection can be cost and time consuming
  - Specific models require **specific data**
- **Quality Assurance** and **Validation**
- **Systematized** and **continuous** data collection (**time series**) frameworks are important
- The best time to start is **now!**
ITF MODELLING FRAMEWORK
ITF Modelling framework

• Allows testing the impact of various policies, measures, and trends in:
  – **Freight**: Urban, Non-Urban (global)
  – **Passenger**: Urban, Non-Urban (global)

• Scenarios are built into the model with direct stakeholder engagement to ensure the inclusion of relevant and interesting policy scenarios.

• **Simultaneous estimation** in common network and zoning system

• Based on traditional 4-step model approach

• In terms of the technology/and efficiency of vehicles,
  – NEW ITF FLEET MODEL
  – Previously: IEA MoMo model
ITF Modelling framework

Global Assumptions
GDP, Trade, Demographics, Energy Prices, Urbanisation

Scenario Variables
Exogenous Factors, Policy measures

Urban Pax
Urban Freight
Interurban Pax
Interurban Freight

Tonne-km; Pax-km
Costs
Accessibility/Connectivity
Reliability
Emissions/Pollutants
ITF Modelling framework

Global Assumptions
GDP, Trade, Demographics, Energy Prices, Urbanisation

Scenario Variables
Exogenous Factors, Policy measures

Urban Pax
Urban Freight
Interurban Pax
Interurban Freight

INPUT Partners

FOCUS

Tonne-km; Pax-km
Costs
Accessibility/Connectivity
Reliability
Emissions/Pollutants
THE ITF NON-URBAN INTERNATIONAL FREIGHT MODEL
ITF Global non-urban freight model

- **Inputs**
  - Trade forecast
  - Network for different modes
  - Economic and demographic
  - Carbon intensity by mode

- **Spatial Discretisation**
  - Centroids for international and domestic freight

- **Scenarios**
  - Policy measures
  - Exogenous demand factors

- **International Freight**
  - Trade disaggregation
  - Trade OD matrix
  - Value-to-Weight
  - Mode choice

- **Domestic Freight**
  - Econometric aggregate
  - National OD matrix
  - Static network assignment

- **Equilibrium Assignment**
  - Maritime transport
  - Surface transport
  - Congestion update

- **Outputs**
  - Freight volumes by link, node, commodity type
  - Port and airports throughput
  - CO₂ emissions

**UPDATE EVERY 5 YEARS**
The level of detail between the regions can vary significantly as a result of the available data.
ITF Global non-urban freight model: Components

Equilibrium multimodal assignment

- Completely **integrated multimodal** network, that includes:

1. **Maritime**
2. **Roads and Highways**
3. **Inland Waterways**
4. **Railways**
APPLYING THE MODEL TO ARGENTINA
Overview

• Project relied on the Global Freight Model
• Policy Scenarios designed in direct collaboration with Argentina
  • The ITF does not advocate for particular solutions
  • The inclusion or exclusion of a particular measure does not imply a value judgement
• Output was generated for three different timeframes: 2015, 2030, and 2050
• Required extensive validation of data at the national scale
Policy scenarios

Defined collaboratively:
1. Baseline: reference point
2. Intermodal and infrastructure improvements
3. Fleet renewal with transition to gas
4. Urban freight fleet electrification
5. E-commerce
6. Global trends
7. Combined

Defined in collaboration with Ministry include regional and global scenarios
ADAPTING THE MODEL TO A NATIONAL SCALE
Challenges and Opportunities of implementation at national scales

• Implementation at national scales requires effort to **validate** and **recalibrate** the model
• **Quality data is essential**
• **Refining the resolution** allows for more **interesting insights**
• Test **national** and **regional/global** policies and trends simultaneously
  – Regional scenarios have advantages: coherent measures in terms of regionalization and other trends that are not applied only in a country
• **LOCAL EXPERT KNOWLEDGE IS KEY!**
1. **Centroids** increased
   - 1 international centroid/province *(24 total)*

2. Entire **multimodal Transport network** was defined and validated
   - 58,642 km of roads
   - 23,128 km of rail
   - 2,241 km of inland waterways

3. International **Entry and Exit points** were defined
   - Border Crossings by mode
   - Ports
Proposed upgrades in scenario 2 (Intermodal and infrastructure improvements)

- Extensive inventory of future upgrades to the network based on:
  - Expert consultation
  - Review of existing plans and proposals
Validated and updated to more accurately reflect the Argentinian reality

Based on IEA MOMO
- **Regional values** (e.g. Modes, Vehicle Types, Energy sources)
- **NEW: INTERNAL ITF FLEET MODEL**

To differentiate by country we need to adapt the model
- Requires **detailed data**:  
  - Fleet Composition  
  - Carbon Intensity of fleet (by type of **vehicle** and **fuel**)

Emission factors updates
RESULTS HIGHLIGHTS
Emissions from surface freight transport increase in the Baseline

20% in the period from 2015 to 2030

28% in the period to 2050.
Trends such as e-commerce would impact the amount of freight being transported.
Results: demand variation

Variation of demand compared to the Baseline (% based on Tonne-kilometres)

- Intermodal
- Fleet Renewal
- Electrification
- Ecommerce
- Trends
- Combined
Emissions from surface freight transport

Surface freight emissions in Argentina by mode (thousand tonnes of CO$_2$)

Variation of emissions compared to the Baseline (%)
The transition to gas *per se* is responsible for 15% of the total reduction of carbon emissions of heavy long haul trucks by 2030.

Increased *vehicle efficiency* and improvements to *operations* enable the remaining 85%.

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**Note:** All emissions considered in this analysis are tank-to-wheel; upstream methane leaks are not accounted for. The latter can decrease emissions reductions from a transition to gas when accounting for well-to-wheel emissions.
Emissions combined scenario

Emissions could be **cut by half** in 2050 compared to 2015.
KEY TAKEAWAYS AND CALLS TO ACTION
Main steps to decarbonise freight transport in Argentina

1. Renew fleets and improve road freight operations (in urban and non-urban areas)

2. Foster intermodality where modal shifts can be achieved and activity increases can be avoided

3. Combine measures that complement one another (infrastructure, operations, policy and pricing)
Calls to action for policy makers in Argentina

1. Pursue bold actions to decrease emissions from freight transport.

2. Enhance the monitoring and reporting of emissions by transport sub-sector.

3. Install appropriate institutional frameworks that allow to implement pathways to reduce emissions, while promoting transport resilience and efficiency.
SCENARIO EXPLORATION TOOL
Main sections of the tool

- Emissions
- Foreign trade
- Modal share
- Cost
- Travel time
**VISUALIZATION TOOL**

**Descarbonizando los Transportes en Economías Emergentes: Argentina**

**Dashboard: Escenarios de políticas públicas para descarbonizar el sistema de transporte en Argentina**

El presente documento presenta los impactos de siete escenarios de políticas de descarbonización sobre las emisiones, la demanda, los costos y los tiempos de viaje del transporte de carga en Argentina. Se resaltan las medidas y tendencias que impactarán a Argentina y sus conexiones internacionales en los decenios a venir.

### Escenarios de políticas de descarbonización

1. **Base**
   - Mejoras en el rendimiento de transporte ferroviario, vías en carreteras y caminos, puertos y pasos internacionales.
   - Mejora en las soluciones intermoda.

2. **Mejoras intermodales y de infraestructura**
   - Renueva la flota interurbana con transición a gas.
   - Electrificada del transporte urbano de carga.
   - Electrificación de las fábricas de combustibles de gas.

3. **Renovación de flota interurbana con transición a gas**
   - Renueva la flota de camiones de carga medio y pesados con una inversión en la movilidad por gas natural antes del 2030.

4. **Renovación de flota terrestres de camiones de carga medio y pesados con una inversión en la movilidad por gas natural antes del 2030.**

5. **Electrificación del transporte urbano de carga**
   - Electrificación de las fábricas de combustibles de gas.
   - Electrificación de las fábricas de combustibles de gas.

6. **Comercio en línea**
   - Mejora en la demanda de mercancías a la demanda en línea.

7. **Tendencias globales**
   - Mejora en la demanda de mercancías a la demanda en línea.
   - Electrificación de las fábricas de combustibles de gas.

**En el Escenario Base las emisiones del transporte de carga de superficie en Argentina aumentarán un 20% en 2030 y 26% en 2050, en comparación con los niveles de 2015. Aunque se proyecta que se tomen algunas medidas para descarbonizar el sector transporte en dicho escenario estas medidas gradualmente no llegarán a alterar el paradigma del transporte de carga. Por esta razón, los beneficios que se obtienen al reducir la intensidad de carbono se ven superados por el aumento sustancial de la demanda.**
THANK YOU FOR YOUR ATTENTION

JOHN P. PRITCHARD, PH.D.

JOHN.PRITCHARD@ITF-OECD.ORG

2 RUE ANDRÉ PASCAL

F-75775 PARIS CEDEX 16